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Hyperon physics with BESIII

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Many of the most intriguing questions in contemporary physics manifest themselves in the nucleon puzzles: despite being known for more than a century, basic properties like its mass, spin, structure, radius and abundance are to this day subjected to intense discussions and research. One approach to shed light on a system one wants to learn more about is to replace one of its building blocks and see how the system reacts. This leads to the central question in hyperon physics: what happens if we replace one of the light quarks in a proton, with a heavier one? Thanks to the weak, self-analysing decay of the ground-state hyperons, their spin properties are straight-forward to access experimentally. This provides a unique opportunity to study the role of spin in non-perturbative strong interactions. Experiments performed with various probes and in different energy regimes show that hyperons often are produced polarised, even when the initial state is unpolarised. Furthermore, it offers a diagnostic tool to study fundamental symmetries, e.g. CP conservation, since spin behave differently with respect to momentum under parity inversion. The violation of CP symmetry is one of the necessary conditions for the dynamic generation of the abundance of matter with respect to antimatter, i.e. Baryogenesis.
The BESIII experiment in Beijing, China, offers unique opportunities to study hyperons in clean, exclusive two-body processes. These conditions enable the application of new, multidimensional techniques providing optimal precision. In this talk, I will present recent hyperon physics results from BESIII with emphasis on electromagnetic structure studies and CP symmetry tests.

Collaboration

BESIII

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